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Notes on Carex—IX

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CAREX STRAMINEA WILLD. AND SOME OF ITS NEAREST ALLIES

The original description of *Carex straminea* Willd. (Schkuhr, Riedgr. 49. 1801) reads as follows: "C. spiculis ovatis distantibus, capsulis obovatis acuminatis, margine hispidis." The accompanying figure (*f. 34*) illustrates a plant with a strongly obovate perigynium body abruptly contracted into a beak much less than half the length of the body. The identity of the species was for many years obscured owing to the fact that Schkuhr later (Riedgr. Nachtr. *f. 174.* 1806) gave another illustration of a plant which he took for *Carex straminea* Willd. Unfortunately he illustrated a related but distinct species (*Carex straminea* var. *brevior* Dewey), and further changed the description (*l. c.* 23) to correspond with the plant so illustrated.

Professor Bailey (Mem. Torrey Club **1**: 21–22. 1889) pointed out this error, and at the same time identified *Carex straminea* Willd. with a slender weak plant which had been distributed as *Carex tenera* Dewey by Sartwell and by Olney. In this identification he was followed by Professor Fernald (Proc. Am. Acad. **37**: 450. 1902), who later also pointed out that the plant distributed by Sartwell and by Olney was in fact the real *Carex tenera* Dewey (Rhodora **8**: 165. 1906). The fact that this plant has an ovate perigynium body, and the genuine *Carex straminea* Willd. an obovate perigynium body was not pointed out. Field work and a steady accumulation of specimens has served to emphasize the differences between these

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two plants, and to justify Dewey in having proposed *Carex tenera* as a distinct species.

The real *Carex straminea* is a tall slender but rather stiff plant of wet soil with stiff, little flexuous inflorescence; the lower nodes are exposed, and the sheaths are green-striate ventrally nearly to the apex, the hyaline portion being short. The body of the perigynium is strongly obovate and abruptly contracted into a short beak less than half the length of the body; it is thin except where distended by the achenes, and is strongly but finely five- to seven-nerved ventrally over the stipitate achene. The scales are not brownish tinged, but are hyaline with a conspicuous green strip on each side of the midvein.

On the other hand, *Carex tenera* Dewey is usually a very slender plant of dry soil with slender, flexuous inflorescence; the lower nodes are not exposed and the sheaths are conspicuously hyaline ventrally. The thick ovate perigynium tapers into the short beak, and is less strongly three- to five-nerved ventrally over the substipitate achene. The scales are reddish brown tinged and lack the conspicuous green strip on each side of the midvein.

After separating these two plants a third element still remained in the aggregate which had been referred to *Carex straminea*. This has the nodes and sheaths as in *Carex tenera*. The leaves, however, are wider, and the plant is much less slender. The inflorescence consists of from four to nine spikes, which are normally strongly clavate at the base and not rounded as in the other two species. The body of the perigynium is suborbicular or orbicular and contracted into a beak half the length of the body, which is thick and but faintly three- to five-nerved ventrally. The scales are more or less strongly reddish-brown tinged. This plant is an exact match for *Carex festucacea* Schkuhr (Riedgr. Nachtr. 23. *f.* 173. 1806), and should take that name.

The plant which has of late years been treated as *Carex festucacea* and as *Carex festucacea* var. *brevior* (Dewey) Fernald commonly has three to six little separated spikes rounded at the base, but occasionally has more numerous and more separated spikes which are then apt to be more staminate and hence more clavate at the base. It is well distinguished from the species above described by the perigynium exceeding 4 mm. in length, while the

beak is much less than half as long as the body. The suborbicular achenes are twice as large as the broadly oval achenes of genuine *Carex festucacea*. This plant should be known as **Carex brevior** (Dewey) Mackenzie,* comb. nov.

Detailed descriptions of each of these three species and lists of the specimens examined follow.

CAREX STRAMINEA Willd.; Schk. Riedgr. 49. *pl. G, f. 34.* 1801

Densely cespitose, the culms slender, 2.5–9 dm. high, exceeding leaves, sharply triangular and roughened on the angles immediately beneath the head, the lower leaves much reduced. Leaves with well-developed blades three to five to a fertile culm, on the lower third but much separated, the blades flat, erect-ascending, attenuate, 2–3 mm. wide, usually 5–15 cm. long, the margins rough; the sheaths loose, green-striate ventrally nearly to apex; sterile culm leaves more numerous. Spikes three to ten, aggregated, approximate or more or less separate in a stiff head 2.5–6 cm. long, the spikes 6–10 mm. long, 4.5–6 mm. wide, ovoid, rounded at apex, the terminal long clavate and staminate at base, the lateral rounded or short clavate and sparingly staminate at base with fifteen to thirty appressed-ascending perigynia with erect or ascending or somewhat spreading beaks; bracts scale-like or the lowest often cuspidate-prolonged, 5–20 mm. long. Scales ovate, acute or short acuminate, white-hyaline with green strip on each side of mid-vein slightly light brownish tinged, narrower and shorter than perigynia. Perigynia green or greenish, the body obovate, thin except where distended by achene, wing-margined to base, 1.5–2 mm. broad, 3.5 mm. long, many-nerved on outer face, lightly about five-nerved on inner face over achene, with an additional nerve in either margin, rounded at base, abruptly contracted into a beak half the length of body, the beak obliquely cut dorsally, flat and strongly serrulate, as is upper third of perigynium body. Achenes lenticular, brownish, oval-oblong, substipitate, 1.5 mm. long, 0.75 mm. wide, slightly apiculate, and continuous with slender flexuous style; stigmas two.

The more strongly developed specimens of this species bear a strong resemblance to *Carex alata* Torr. They are to be distinguished by the smaller perigynia which are more strongly nerved ventrally and only obliquely cut at the apex, as also by the less strongly stipitate achenes.

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* *Carex straminea* var. *brevior* Dewey, Am. Journ. Sci. 11: 158. 1826.

SPECIMENS EXAMINED

NEW YORK: Yonkers, *Bicknell*, June 16, 1895 (C.); Lowerre, *Bicknell*, July 4, 1891, June 9, 1895 (C.); "New York," *Torrey* (C.).

NEW JERSEY: Mickleton, *Crawford*, May 10, 1892 (P.); Trenton, *Brown*, May 29, 1904 (P.); Riddleton, Salem County, *MacElwee*, June 15, 1895 (P.); Eagle Rock, Essex County, *Mackenzie 1445*, July 4, 1905 (K. M.).

PENNSYLVANIA: Tannersville, *Brown*, July 4, 1896 (P.); Ex Herb. *Schweinitz* (P.); West Philadelphia, *MacElwee*, June 14, 1894 (P.); Point Pleasant, *Fretz*, June 22, 1898 (P.); Jordan Valley, Lehigh County, *Pretz 6800, 6809*, July 4, 1914 (P.); Diamond Rock, Chester County, *Bartram 1532*, June 18, 1911 (P.); Pricetown, Bucks County, *Britton*, July, 1915 (N. Y.).

DELAWARE: Vandyke, Newcastle County, *Long*, July 3, 1909 (P.); Newcastle County, *Commons*, June, 1872 (P.).

MARYLAND: Hyattsville, *Steele*, June 7, 1903 (K. M.).

DISTRICT OF COLUMBIA: Washington, *Steele*, June 5, 1902 (K. M.); Washington, *Kearney*, June 6, 1897 (N. Y.).

INDIANA: Patoka, Gibson County, *Deam 13318*, June 9, 1913 (K. M.).

ILLINOIS: Cobden, *Earle 730*, May 23, 1912 (N. Y.).

MISSOURI: Atherton, *Bush 6800*, June 7, 1912 (N. Y.); Greenwood, *Bush 6707A*, May 20, 1912 (N. Y.).

TENNESSEE: Henderson, *Bain 501*, May 13, 1893 (C.).

GEORGIA: Milledgeville, *Boykin* (C.); Burke County, *Harper 797*, June 5, 1901 (N. Y.).

FLORIDA: *Chapman* (C.); Jacksonville, *Curtiss 4743*, May 3, 1894 (C.).

LOUISIANA: *Hale*, 1845 (C.); *Leavenworth*, 1845 (C.).

CAREX TENERA Dewey, Am. Journ. Sci. **8**: 97. 1824
(also **9**: *pl. c, f. 9.* 1825)

Carex festucacea var. *tenera* Carey; A. Gray, Man. 545. 1848. *Carex straminea* var. *tenera* Boott, Ill. Car. **3**: 120, *pl. 384.* 1862. *Carex tenera* forma *erecta* Olney; Kükenthal, Engler's Pflanzenreich 4^{20}: 205. 1909 (as synonym).

Densely cespitose, the culms slender, erect, 3–7.5 dm. high, sharply triangular and roughened on angles above, much ex-

ceeding leaves, dark at base, the lower leaves reduced, the lower nodes not exposed. Leaves with well-developed blades three to five to a fertile culm, on lower third but not bunched, the blades flat, 1.5–2.5 mm. wide, usually 7.5–30 cm. long, the sheaths tight, but obscurely septate-nodulose, conspicuously hyaline ventrally and prolonged upward. Inflorescence of four to eight spikes in a more or less strongly moniliform head 2.5–5 cm. long, the spikes ovoid, gynaecandrous, rounded at apex, 6–10 mm. long, 4.5–6 mm. wide, with ten to twenty appressed perigynia above, the tips appressed, rounded and with few staminate flowers at base (except in terminal spike); lowest bract short, setaceous, the upper scale-like. Scales ovate, acute, hyaline with green midvein, and tawny tinged, narrower and shorter than perigynia. Perigynia green or in age straw-colored, ovate, 3.5 mm. long, nearly 2 mm. wide, the body suborbicular, thickish, plano-convex, winged to base, strongly about five-nerved dorsally over achene with an additional nerve in both margins and similarly but less strongly nerved ventrally, rounded and sessile at base, contracted into beak half length of body, the beak tawny tipped, obliquely cut dorsally, flat and strongly serrulate, as is upper half of perigynium body. Achenes broadly ovoid, plano-convex, light brown, substipitate, 1.25 mm. long, 1 mm. wide, apiculate, the style slender, straight. Stigmas two.

SPECIMENS EXAMINED

MAINE: Pittsfield, *Knight*, June 18, 1905 (K. M.); Mt. Hope, *Knight*, July 1, 1906 (K. M.); Orono, *Knight*, July 15, 1904 (K. M.).

MASSACHUSETTS: Middlefield, Hampshire County, *Fernald & Long 8991*, *8992*, June 26, 1913 (P.); North Adams, Berkshire County, *Fernald & Long 8990*, June 25, 1913 (P.); "Massachusetts, *Dewey*" (P.).

NEW YORK: Dundee, Yates County, *Wright* (K. M.); Lansingburgh, *Howe*, June, 1891 (N. Y.); Oneida County (C.).

NEW JERSEY: Netcong, Morris County, *Mackenzie 2078*, June 10, 1906 (K. M.).

PENNSYLVANIA: Ft. Washington, Montgomery County, *Long*, June 16, 1908 (P.).

DELAWARE: Vandyke, *Long 1742*, May 24, 1909 (P., K. M.).

MICHIGAN: Emerson, Chippewa County, *Dodge*, Sept. 5, 1914 (K. M.); Imlay City, Lapeer County, *Dodge*, June 11, 1911 (K. M.); Port Huron, *Dodge*, May 14, 1896 and May 28, 1896 (K. M.).

INDIANA: Bushrod, *Deam 10712*, May 26, 1912 (K. M.).

ILLINOIS: Fountaindale, Winnebago County, *Bebb* (P., K. M.).

SOUTH DAKOTA: Jones Island, *Williams 1876*, August 15, 1894 (K. M.).

NORTH DAKOTA: Butte, Benson County, *Lunell*, July 26, 1914 (K. M.); Lake Ibsen, Benson County, *Lunell*, July 4, 1914 (K. M.); Towner, McHenry County, *Lunell*, July 21, 1908, Sept. 10, 1908, June 12, 1913 (K. M.); Leeds, Benson County, *Lunell*, June 2, 1901 (K. M.).

NEW MEXICO: Brazos Canyon, Rio Arriba County, *Standley & Bollman 11036*, Sept. 1, 1914 (K. M.).

CAREX FESTUCACEA Schk.; Willd. Sp. Pl. 4: 242. 1805

Carex straminea var. *festucacea* Tuckerm. Enum. Meth. 18. 1843.

Densely cespitose, the culms slender but rather stiff, erect, 5–9 dm. high, sharply triangular and roughened on angles above, much exceeding leaves, the lower leaves reduced, the lower nodes not exposed. Leaves with well-developed blades three to five to a fertile culm, on lower third of culm, but not bunched, the blades flat, 1.5–2.5 mm. wide, usually 7.5–30 cm. long, the sheaths tight, sparingly septate-nodulose, conspicuously hyaline ventrally and prolonged upward. Inflorescence of four to ten spikes, in a moniliform head 2.5–6 cm. long, the spikes gynaecandrous, rounded at apex, 6–16 mm. long, 5–6 mm. wide, with ten to twenty appressed-ascending perigynia above with rather conspicuous tips, usually strongly clavate with numerous staminate flowers at base; lowest bract occasionally somewhat developed, the others scale-like. Scales ovate, acute, hyaline with green midvein, and tawny tinged, narrower and shorter than perigynia. Perigynia green or in age straw-colored, 3.5 mm. long, 2 mm. wide, the body orbicular, thick, plano-convex, winged to base, strongly about five-nerved dorsally over achene with an additional nerve in both margins, and similarly but less strongly nerved ventrally, rounded and sessile at base, abruptly contracted into a beak nearly length of body, the beak tawny-tipped, obliquely cut dorsally, flat and strongly serrulate as is upper half of perigynium body. Achenes oblong-ovoid, plano-convex, light-brown, short-stipitate, 1.5 mm. long, nearly 1 mm. wide, apiculate, the style slender, straight. Stigmas two.

SPECIMENS EXAMINED

MASSACHUSETTS: "Massachusetts," *B. D. Greene* (C.).

NEW YORK: Penn Yan, *Sartwell* (N. Y.).

NEW JERSEY: Farmingdale, Monmouth County, *Long &*

Brown 3601, May 28, 1910 (P., K. M.); Summit, Union County, *Mackenzie 159*, May 30, 1903 (K. M.); Monmouth Junction, *Mackenzie 4964, 4970*, May 26, 1912 (K. M.); Mt. Arlington, Morris County, *Mackenzie 1422*, June 25, 1905 (K. M.); Stirlington, Morris County, *Mackenzie 1268*, May 28, 1905 (K. M.).

PENNSYLVANIA: Valley Forge, Chester County, *Long*, June 24, 1909 (P.); Ryers, Philadelphia County, *Long*, June 15, 1909 (P.); Radnor Township, Delaware County, *Bartram*, June 10, 1907 (P.); Sellersville, *Crawford*, June 11, 1899 (P.); Byberry, *Martindale* (P.); Lanark, Lehigh County, *Pretz 4474*, June 1, 1912 (P.); Mountainville, Lehigh County, *Pretz 413*, June 15, 1907 (P.); Fern Rock, Philadelphia County, *Long*, June 13, 1908 (P.); Penllyn, Montgomery County, *Long 1703*, June 12, 1909 (P., K. M.); Corning, Lehigh County, *Pretz 3379*, May 21, 1911 (P.); New Garden, Chester County, *Pennell 4999*, June 12, 1913 (P.); Glen Riddle, Delaware County, *Pennell 3801*, June 23, 1912 (P.); Willow Grove, *Saunders*, June 4, 1898 (P.); Nottingham, Chester County, *Pennell & Long 7486*, June 22, 1912 (P., K. M.); "Pennsylvania," *Collins* (C.).

DELAWARE: Mt. Cuba, *Commons*, June 23, 1874 (P.); Faulkland, *Commons*, June 10, 1892 (P.).

MARYLAND: Beltsville, *Steele*, May 30, 1903 (K. M.).

NORTH CAROLINA: Salem, *Schweinitz* (P.).

TENNESSEE: Henderson, *Bain 10999*, May, 1893 (K. M.).

INDIANA: Hovey Lake, Posey County, *Deam 8303*, May 23, 1911 (K. M.); Bicknell, *Deam 11060*, June 7, 1912 (K. M.).

MISSOURI: Sheffield, *Bush 3904*, June 2, 1906 (K. M.); Sibley, *Mackenzie 88*, May 30, 1898 (K. M.); Independence, *Mackenzie*, May 23, 1897 (K. M.); Butler County, *Bush 2545*, May 1, 1905 (K. M.); Lake City, *Bush 6835*, June 20, 1912 (K. M.); Atherton, *Bush 6800*, June 7, 1912 (K. M.); Greenwood, *Bush 6707A*, May 20, 1912 (K. M.).

ARKANSAS: Texarkana, *Bush 2501*, April 28, 1905 (K. M.).

MISCELLANEOUS NEW SPECIES OF CAREX

Carex festivella sp. nov.

Cespitose from short-creeping tough matted blackish fibrillose root-stocks, the culms stout at base, slender but stiffish above,

3–6 dm. high, triangular and somewhat roughened beneath head, conspicuously striate, exceeding leaves, aphyllopodic, light brown at base, mostly developing and flowering same year. Leaves with well-developed blades three to five to a fertile culm, on lower fourth, but not bunched, the blades erect, 2–4 mm. wide, mostly 1–2 dm. long, flat, the sheaths tight, hyaline ventrally, concave at orifice. Sterile shoots similar. Head ovoid or oblong-ovoid, 12–25 mm. long, 10–18 mm. wide, with five to ten densely aggregated but distinct gynaecandrous spikes, the latter oblong-ovoid, 5–12 mm. long, 4–8 mm. wide, rounded or round tapering at base and round tapering at apex, the perigynia fifteen to thirty, densely arranged in many rows, appressed with erect ascending tips. Lowest bract somewhat prolonged, shorter than head, the others scale-like. Scales ovate, obtuse or acutish, dark chestnut to brownish-black with lighter poorly defined midvein and narrow hyaline margins, narrower and shorter than perigynia. Perigynia ovate, 3.75–5 mm. long, 1.5–2 mm. wide, thin, save where distended by achene, the walls membranaceous, light green or stramineous, the beak strongly dark-tinged, lightly several-nerved on both faces, rounded at base, strongly thin-margined, tapering into a beak half the length of body, serrulate to middle, the beak hyaline-tipped, obliquely cut ventrally. Achenes lenticular, obovoid, substipitate, 1.5 mm. long, 1 mm. wide, apiculate, the slender style tardily deciduous. Stigmas two.

The type specimens of *Carex festiva* Dewey were collected by Richardson "at Bear Lake and on the Rocky Mountains." These specimens or duplicates thereof marked as collected at Bear Lake are in the Torrey herbarium at the New York Botanical Garden, and represent a widely distributed boreal species known from the far northern regions of Canada, from Labrador, from Greenland and from various far northern points in Europe. Specimens which I cannot distinguish also come from the extreme southern part of South America, and associated with them is the name *Carex macloviana* D'Urv. This name has about ten years priority over *Carex festiva* Dewey, and accordingly must be used for the boreal plant under discussion.

This boreal plant is one representative of a series of closely related species, many of which are found in the higher mountains of the western part of North America. Taking these species together the tendency is rather strongly toward the development of a more congested inflorescence than is found in *Carex straminea*

and its numerous allies, so widely distributed especially in the eastern part of North America. This, however, is only a tendency, as a number of species of the *C. festiva* group, especially from California, have an elongated inflorescence; while on the other hand a number of species of the *C. straminea* group have a congested inflorescence.

Probably the best character to use to separate the two groups is that in the *C. festiva* group the beak of the perigynium towards the apex is slender and almost terete, and the margin for the last one or two millimeters is smooth or very sparingly serrulate. On the other hand in the *C. straminea* group the beak of the perigynium is flat and serrulate-margined to the tip.

For many years the name "*Carex festiva* Dewey" has been applied to specimens from the western mountains, and a plant especially common in Colorado and Wyoming has been taken to be the typical form. In this plant, which is the *C. festivella* of the present paper, the perigynium tapers into a dark slender beak half the length of the much lighter colored body and contrasting strongly with it in color. In the genuine boreal plant both body and beak are reddish tinged and the beak is only one fourth or one fifth the length of the body. In both species the extreme tip of the perigynium is hyaline. The Rocky Mountain plant is striate-nerved on the inner face; the boreal plant is essentially nerveless.

In addition to those characters taken from the perigynium it may be added that the boreal plant has reddish scales and the Rocky Mountain plant dark colored scales.

In the boreal plant the fertile culms develop several leaves the first year, and at flowering time in the second year these remain in a more or less dried-up condition at the base of the culms. As a result of this manner of growth there are always present numerous well-developed flowerless culms in a clump consisting of the first year fertile shoots and the more leafy sterile shoots.

In the Rocky Mountain plant the fertile culms normally develop all their leaves and flower during one year, and in consequence there are no old dried-up well-developed leaves towards the base of the flowering culms. At flowering time the shoots for the next year are very evident, but have no developed leaves. As

a result at flowering time the flowerless culms are few in number, consisting only of the sterile shoots. While this difference in manner of growth is very characteristic one must bear in mind that any unusual spell of warm weather towards the end of a season is apt to start into premature growth a shoot ready for quick development the next year. When this happens the result is the same biennial method of growth as in the boreal plant. While this is not of very frequent occurrence, it makes the use of this difference in habit of growth hardly useful as a key character.

For the group the Rocky Mountain plant under discussion usually has stout culms and broad leaf-blades and presents a very green general appearance. The closely allied *Carex microptera* Mackenzie has narrower perigynia which are very narrowly margined at base and have more spreading beaks giving the head an echinate appearance lacking in the present species.

Aven Nelson's No. 3275, collected July 2, 1897, in Albany County, Wyoming, and in my herbarium, may be taken as the type of *C. festivella*. A duplicate is in the New York Botanical Garden herbarium. The species ranges from the Cypress Hills in Saskatchewan and the Black Hills in North Dakota west to eastern British Columbia and southward through the Rocky Mountain region to Chihuahua, its best development being apparently in Colorado and Wyoming where it is one of the most characteristic mountain species.

SPECIMENS EXAMINED

CANADA: Between Keith and Columbia Rivers, *J. Macoun 63304*, July 8, 1902 (N. Y.); Banff, *J. Macoun*, July 12, 1891 (C.); Cypress Hills, Assiniboia, *J. Macoun 7397*, June 25, 1894 (C.); above Carbonate, *Petersen 225*, July 9, 1904 (N. Y.).

SOUTH DAKOTA: Rochford, Black Hills, *Rydberg 1087*, July 12, 1892 (N. Y.); Custer County, *Over 1768*, June 20, 1914 (K. M.).

MONTANA: Bozeman, *Rydberg 3002*, July 7, 1896 (N. Y.); Little Belt Mountains, *Flodman 305*, August 10, 1896 (N. Y.); Jocko Creek, *MacDougal 280*, June 16, 1911 (N. Y.); MacDougal's Peak, *MacDougal 601*, July 10, 1901 (N. Y.); Spanish Basin, *Rydberg & Bessey 3798*, June 28, 1897 (N. Y.); Aldridge, *Mrs. Scheuber 110*, 1901 (N. Y.); Elk Mountains, *Rydberg 3017, 3289*,

3342, 1896 (N. Y.); Long Baldy, Little Belt Mountains, *Rydberg 3395, 3403*, August 20, 1896 (N. Y.); Bridger Mountains, *Rydberg & Bessey 3793*, June 14, 1897 (N. Y.); Little Belt Pass, *Rydberg 3340*, August 11, 1896 (N. Y.); Midvale, *Umbach 364*, July 13, 1903 (K. M.).

IDAHO: Victor, *Merrill & Wilcox 890*, July 10, 1901 (N. Y.); Beaver Cañon, *Shear 293* in part, June 26, 1895 (N. Y.).

WYOMING: Big Horn Mountains, *Tweedy 2237*, July, 1899 (N. Y.); Cliff Creek, *Curtis*, August, 1900 (N. Y.); Soda Butte Creek, *A. & E. Nelson 5869*, July 14, 1899 (N. Y.); Green Top, *Nelson 3255*, June 29, 1897 (N. Y.); Medicine Bow Range, *Kemp*, June, 1902 (N. Y.); Big Horn Mountains, *Tweedy 2238*, August, 1899 (N. Y.); Chug Creek, Albany County, *Nelson 7336*, June 29, 1900 (N. Y.); Pole Creek, Albany County, *Nelson 1926*, June 13, 1896 (N. Y.); Encampment, Carbon County, *Tweedy 4318, 4323*, July 12, 1901 (N. Y.); Centennial Valley, Albany County, *A. Nelson 3275*, July 2, 1897 (N. Y., K. M.); Battle Lake, *A. Nelson 4012*, August 16, 1897 (N. Y., K. M.); Indian Grove Mountains, *E. Nelson 4899*, July 18, 1898 (N. Y.); Laramie, *A. Nelson 288*, June 28, 1894 (C.); La Plata Mines, *A. Nelson 1786*, August 22, 1895 (C.); Welcome, *Williams*, July 26, 1897 (K. M.); Big Horn Mountains, *Buffum 5012*, August 1, 1892 (K. M.); Carbon County, *A. Nelson 3996*, 1897 (K. M.); Sand Creek, *Williams 2689*, July 26, 1897 (K. M.); Rattlesnake Gulch, *Williams*, July 26, 1897 (K. M.); Albany County, *A. Nelson 3255*, 1897 (K. M.); East De Lacy's Creek, *Rydberg & Bessey 3791*, August 10, 1897 (N. Y.); Swan Lake, *Mearns 3302*, August 16, 1902 (N. Y.); *Edith A. Ross*, July, 1890 (N. Y.).

COLORADO: La Plata Cañon, *Baker, Earle & Tracy 699*, July 11, 1898 (N. Y.); Dolores, *Crandall*, June 18, 1892 (N. Y.); Pass Creek, *Rydberg & Vreeland 6453*, June 30, 1900 (N. Y.); *State Agricultural College Distribution 2547*, July 30, 1899 (N. Y.); *Baker*, July 12, 1899 (N. Y.); Crystal Park, *Bessey*, July 23, 1894 (N. Y.); Bob Creek, *Baker, Earle & Tracy 731*, June 28, 1898 (N. Y.); Sangre de Christo Creek, *Rydberg & Vreeland 6452*, June 22, 1900 (N. Y.); West Indian Creek, *Rydberg & Vreeland 6451*, June 14, 1900 (N. Y.); Pagosa Peak, *Baker 231*, August, 1898 (N. Y.); Cascade Cañon, *Bessey*, July 12, 1895 (N. Y.);

Rocky Mountains, *Hall, Olney distribution* (N. Y., K. M.); Silver Plume, *Rydberg 2462*, August 24, 1895 (N. Y.); Northern Colorado, *Tweedy 4319*, July 2, 1901 (N. Y.); Glen Haven, *Johnston 724*, August 8, 1910 (N. Y.); Mt. Richtophen, *State Agricultural College distribution 2542*, August 7, 1899 (N. Y.); Mt. Carbon, *Nelson 78*, July, 1909 (N. Y.); Clear Creek, *Parry 391*, 1861 (C.); Mt. Carbon, *Eggleston 5883*, July 6, 1910, and *5924*, *5904*, July 9, 1910 (K. M.); Kebler Pass, *Eggleston 6168*, August 22, 1910 (K. M.); Summit County, *Mann*, July, 1899 (K. M.); Breckenridge, *Mackenzie 158*, August, 1901 (K. M.).

UTAH: Dyer Mine, Uintah Mountains, *Godding 1309*, July 9, 1902 (N. Y.); and *1354*, July 14, 1902 (N. Y.); Fish Lake, *Jones*, August 6, 1894 (N. Y.); Fish Lake, *Rydberg & Carlton 7520*, August 10, 1905 (N. Y.); Twin Creeks, *Rydberg & Carlton 7652*, August 8, 1905 (N. Y.); Big Cottonwood Cañon, *Rydberg 6816*, July 8, 1905 (N. Y.); Big Cottonwood Cañon, *Rydberg & Carlton 6627*, July 4, 1905 (N. Y.); Big Cottonwood Cañon, *Rydberg & Carlton 6395* in part, June 28, 1905 (N. Y.); Alta, Wahsatch Mountains, *Jones 1095*, July 29, 1879 (C.); Unionville, *Watson*, June, 1865 (C.); Cottonwood Cañon, *Watson 1235*, July, 1869 (C.).

NEVADA: Summit Lake region, *Griffiths & Morris 325*, July, 1901 (N. Y.).

NEW MEXICO: Bartlett Ranch, Colfax County, *Wooton*, September 4, 1913 (K. M.); Mogollon Mountains, *Metcalfe 287*, July 20, 1903 (N. Y.); Pecos River National Forest, *Standley 4131*, July 1, 1908 (N. Y., K. M.); Santa Rita Creek, *Thurber 151*, 1851 (N. Y.); Copper Mines, *Bigelow*, as *C. Hoodii* (N. Y., C.); Santa Rita del Cobra, *Bigelow*, as *C. Douglasii* (N. Y., C.); Brazos Cañon, *Standley & Bollman 10909*, *11039*, 1914 (K. M.).

CHIHUAHUA: Sierra Madre, *Pringle 1402*, November 3, 1887 (C.).

Carex Egglestonii sp. nov.

In dense clumps, the culms 4.5–7.5 dm. high, stiffly erect, rather stout, aphyllopodic, light brownish at base, exceeding leaves, roughened on angles beneath head. Leaves with well-developed blades four to six to a fertile culm, on lower third, but not bunched, the overlapping sheaths conspicuously white-hyaline opposite the blades, the blades flat, 2–5 mm. wide, usually 1–2 dm. long, not long attenuate; head ovoid, 18–24 mm. long and

somewhat narrower, containing three to six closely aggregated but readily distinguishable gynaecandrous ovoid or ovoid-oblong spikes 10–14 mm. long, 6–10 mm. wide, rounded or short-pointed at apex, the lateral rounded and the terminal one short-tapering at base, the numerous perigynia appressed-ascending in many ranks with rather conspicuous tips, the staminate flowers few and inconspicuous; lowest bract short-prolonged, 6–18 mm. long, or scale-like, the others scale-like; scales ovate or ovate-lanceolate, acutish to short acuminate, chestnut brown with lighter midvein and conspicuous white-hyaline margins, narrower and markedly shorter than perigynia; perigynia olive-green or in age brownish, ovate, 6 mm. long, 3 mm. wide (widest near top of achene), thin except where distended by achene, strongly winged, slenderly nerved on both faces (nearly obsolete in age), rounded and sessile at base, abruptly contracted into a broad flat bidentate non-hyaline slightly colored beak 1.5 mm. long, winged and serrulate to the tip, the teeth strictly erect and contiguous but distinct; achenes lenticular, obovoid-oblong, thickish, substipitate, 2 mm. long, 1.25 mm. thick, short-pointed; style slender, not enlarged at base; stigmas two.

This handsome species of the western mountains is a member of the *Ovales*, and is probably most closely related to *Carex brevior* (Dewey) Mackenzie (see page 605). The type specimen is in the National Herbarium, and was collected by Mr. W. W. Eggleston (No. 6181), at Kebler Pass, Mt. Carbon, Gunnison County, Colorado, August 22, 1910.

SPECIMENS EXAMINED

COLORADO: West Mancos, *Baker, Earle & Tracy 322*, 9500 ft. alt., July 4, 1908 (N. Y.); Kebler Pass, Mt. Carbon, Gunnison County, *Eggleston 6181*, 3120 m. alt., August 22, 1910 (N., N. Y.); Ohio Peak, Gunnison County, *Eggleston 5905* in part, 2900 m. alt., July 9, 1910 (N. Y.).

UTAH: La Sal Mountains, *Rydberg & Garrett 8753, 8754, 9028, 9029, 9075, 9076*, July, 1911 (N. Y.); Abajo Mountains, *Rydberg & Garrett 9771, 9845*, August, 1911, 2500–3700 m. alt. (N. Y.); Uintas, *Watson 1239*, 10,000 ft. alt., July, 1869 (C.).

WYOMING: La Plata Mines, *E. Nelson 5150*, August 25, 1898 (N. Y.).

Carex Lunelliana sp. nov.

Cespitose from short-creeping dark colored woody fibrillose rootstocks, the culms 3–6 dm. high, aphyllopodic, stout. 5–8 mm.

wide at base, rather stiff, sharply triangular, roughened above, equalling or exceeding leaves, light brown at base. Leaves with well-developed blades four to six to a fertile culm, on lower half, not bunched, the sheaths conspicuously septate nodulose dorsally, tardily breaking, truncate and but slightly colored or thickened at mouth, the blades light green, flat, 4–8 mm. wide, mostly 1–2 dm. long. Head ovoid or oblong-ovoid, dense, 1–3 cm. long, 8–15 mm. wide, containing six to twelve androgynous spikes, the lower only distinguishable. Lower bracts at least setaceous prolonged, usually shorter than the head. Spikes with five to fifteen ascending or at maturity spreading perigynia, the apical staminate flowers inconspicuous. Scales ovate, tawny tinged with three-nerved green center, acuminate, cuspidate or short awned, narrower and usually shorter than perigynia. Perigynia plano-convex, 4.25 mm. long, 3.5 mm. wide, the body orbicular, greenish, straw-colored, or at maturity light yellowish-brown and rather shining, nerveless ventrally, several nerved dorsally, sharply smooth-margined nearly to the round-truncate somewhat spongy base, the margins green, not raised, the body somewhat abruptly contracted into a strongly bidentate serrulate beak, one fourth its length. Achene lenticular, filling perigynium, 2 mm. long and as wide, brownish yellow, minutely apiculate, jointed with the deciduous style, the latter with much enlarged base. Stigmas two.

A fine series of specimens collected by Dr. J. Lunell of Leeds, North Dakota, has called to my attention the fact that *Carex gravida* Bailey has been made to cover two distinct species, the more northern plant on which the species was based being different from the southern one. Genuine *Carex gravida* has the perigynia nerveless on both sides or faintly nerved dorsally, the body of the perigynium is ovate and tapers into the beak, and the scales are mostly awned. The southern plant, which has been confused with *C. gravida*, has perigynia strongly nerved dorsally, the body of the perigynium is orbicular and contracted into the beak, while the scales are cuspidate rather than awned. It gives me pleasure to name this plant in honor of Dr. Lunell, who has done so much towards making the flora of North Dakota better known.

SPECIMENS EXAMINED

MISSOURI: Oak Grove, *Bush 7020*, June 2, 1913 (type in Herb. K. M., duplicate in Herb. N. Y. Bot. Garden); Greenwood, *Bush 6709*, May 20, 1912 (N. Y., K. M.); Lees Summit, *Mackenzie*,

June 6, 1897 and May 28, 1899 (K. M.); Levasy, *Bush 1694*, May 18, 1902 (N. Y., K. M.); Grain Valley, *Bush 6984*, May 24, 1913 (K. M.); St. Louis, *Glatfelter*, May 17, 1894 (K. M.); St. Louis, *Eggert*, June 14, 1893 (C.).

KANSAS: Osborne County, *Shear 33*, May 19, 1894 (N. Y.).

OKLAHOMA: Sapulpa, *Bush 939, 945, 1005*, May, 1895 (C.).

Carex bulbostylis sp. nov.

Carex grisea var. *globosa* Bailey; A. Gray, Man. Ed. 6, 605 (at least in part). 1890.

Cespitose, the rootstocks short, hard, rather slender, the culms 2–3.5 dm. high, central and lateral, slender, erect or ascending, obtusely triangular, smooth or nearly so, strongly purplish tinged at base, exceeding leaves but exceeded by bracts; sterile shoots elongated. Leaves with well-developed blades four to ten to a culm, the blades flat with revolute margins 2.5–3.5 mm. long, mostly 1–2 dm. long, or up to 3 dm. on sterile shoots, the sheaths smooth or nearly so. Staminate spike apparently long-peduncled (actually nearly sessile, the uppermost pistillate spike being abortive and with short sheathing bract), 2–3 cm. long, 2.5–3.5 mm. wide, the scales obovate-oblong, whitish with green slightly excurrent midrib, reddish brown tinged. Developed pistillate spikes three or four, the lower on erect rough peduncles, the upper scarcely exsert-peduncled, three- to seven-flowered, oblong or suborbicular; bracts leaf-like, strongly sheathing. Scales broadly ovate, white-hyaline and reddish-brown tinged, with green midvein exserted as long cusp, the body narrower than and about half length of perigynia. Perigynia broadly obovoid, globose in cross-section, 4.5 mm. long, 2.5 mm. wide, finely many striate, green, minutely hispidulous when young, rounded at base and apex. Achenes obovoid, triangular, 3 mm. long, 2 mm. wide, yellowish, tapering to a substipitate base, minutely apiculate, jointed with conspicuously enlarged bulbous base of very short deciduous style; stigmas three, short.

The conspicuously enlarged style-base is the best technical character to separate this species from its allies, *Carex grisea* Wahl. and *Carex amphibola* Steud. The culms are strongly purplish tinged at the base, in this differing from *Carex grisea*. The short and proportionately broader perigynia also serve to distinguish it from that species, and still more so from *Carex amphibola* Steud.

SPECIMENS EXAMINED

TEXAS: Dallas, *Reverchon 2422*, April 13, 1901 (K. M.); also *2419*, March 26, 1901 (K. M.); also *2423*, May 2, 1901 (K. M.); also *2416A*, April 16, 1901 (N. Y., K. M.); Fort Worth, *Ruth 360*, April 12, 1913 (type in Herb. K. M.); Tarrant County, *Ruth 451*, April 4, 1914 (K. M.); Austin, *Rugel* (C.).

Carex onusta sp. nov.

Cespitose from short, fibrillose rootstocks, the culms aphyllopodic, 2–3.5 dm. high, stiff, but rather slender, bluntly triangular below, sharply triangular and roughened above, exceeding leaves, brownish at base. Leaves with well-developed blades three or four to a fertile culm, the sheaths tight, inconspicuously septate nodulose, cross rugulose ventrally and thickened at mouth, the blades green, flat, 2.5–3.5 mm. wide, mostly 1–2 dm. long. Head oblong or oblong-ovoid, dense, 8–13 mm. wide, 1.5–3 cm. long, containing eight to fifteen androgynous spikes, the lower only readily distinguishable. Lower bracts setaceous, shorter than head, the upper scale-like. Spikes with five to fifteen appressed or at length spreading or ascending perigynia, the apical staminate flowers usually forming a conspicuous but short cone. Scales ovate, cuspidate, hyaline, yellowish-brown tinged with green midvein, narrower than and about two thirds length of body of perigynia. Perigynia plano-convex, or slightly bi-convex, 3 mm. long, 1.5 mm. wide, oblong-ovate, green or in age yellowish, nerveless ventrally, obscurely few-nerved dorsally, sharply margined to the rounded non-spongy base, abruptly beaked, the beaked 0.75 mm. long, bidentate, serrulate. Achene plano-convex, filling perigynia 2.5 mm. long, 1.4 mm. wide, minutely truncately apiculate, the style short with much enlarged base. Stigmas two.

The perigynia strongly resemble those of *Carex Leavenworthii* Dewey and the scales are short, as in that species. The heads, however, are elongated, as in *Carex Muhlenbergii* Schk. The thin yellowish-brown tinged scales are peculiar and characteristic.

The type, collected by Professor Albert Ruth, No. 458, on April 24, 1914, in sandy woods in Tarrant County, Texas, is in my herbarium. These specimens are in most excellent condition.

Carex Sheldonii n. sp.

Tufted, strongly stoloniferous, the stolons stout. Culms phyllopodic, 7.5 dm. high, glabrous, obtusely angled and very smooth below inflorescence, exceeding the elongated leaves,

neither colored nor fibrillose at base; leaves with well-developed blades about four to a fertile culm, on lower half, not bunched, the sheaths and surfaces of blades (especially lower) sparsely short-pubescent, the hyaline part of sheaths dark-tinged at edge, the blades flat, 5–6 mm. wide, 2–4 dm. long (or on sterile culms much longer), rough towards apex, the basal sheaths breaking and slightly filamentose; staminate spikes two or three, separate from each other and widely separate from the pistillate, the upper peduncled, the others sessile, linear, 2.5–3.5 cm. long, 3 mm. wide, the bract of lowest conspicuous, the scales oblanceolate, acute, erose but not ciliate at apex, in age straw-colored and hyaline; pistillate spikes two, widely separate, erect, sessile or short exsert-peduncled, oblong-cylindric, 2–5 cm. long, 8–10 mm. wide, the perigynia twenty-five to sixty, ascending in several to many ranks, closely packed or the lower somewhat loosely arranged; bracts leaf-like, the lower sheathing and exceeding inflorescence, the upper smaller, nearly sheathless; scales ovate-lanceolate, acuminate or cuspidate, green and strongly several-nerved in center, with margins hyaline and usually with intermediate brownish tinged zone, narrower and shorter than perigynia; perigynia lanceolate, 5–6 mm. long, about 2 mm. wide, obscurely triangular, little inflated, short pubescent, prominently about fifteen-nerved, tapering into the bidentate beak 2 mm. long (including teeth), the teeth short, less than 1 mm. long, slightly spreading; achenes triangular, oblong-obovoid, 2.25 mm. long, 1.25 mm. wide, stipitate; style slender, straight, not enlarged at base; stigmas three.

One of the most conspicuous features of the eastern *Carex trichocarpa* Muhl., with which the present species has been confused, is the bright purple coloring of the sheaths opposite the blades, especially at the mouth. In addition the sheaths are glabrous or at most hispidulous and do not normally break open and become filamentose. In the present species the sheaths entirely lack this purple coloring, are soft pubescent at least at the mouth and do not readily break open. In *Carex laeviconica* Dewey (a species with glabrous perigynium and impressed nerves) the purple coloring is also lacking, but the glabrous sheaths quickly break open and become filamentose. *Carex atherodes* Spreng. with glabrous very deeply bifurcate perigynia has soft pubescent sheaths which break open readily and are brownish or purple tinged.

SPECIMENS EXAMINED

OREGON: "Along Clark's Creek, about three miles above mouth. Altitude 3,140 ft.," *E. P. Sheldon 8854*, September 9, 1897 (type in Herb. K. M., duplicate in Herb. N. Y. Bot. Garden); Crow Creek, Wallowa County, 4,300 feet alt., *E. P. Sheldon 8428*, June 29, 1897 (N. Y., K. M.); ditch sides of Malheur River, *Cusick 2549*, June 7, 1901 (N. Y.).

IDAHO: House Creek, Owyhee County, *Nelson & Macbride 1826*, June 30, 1912.

CALIFORNIA: "Jess Valley to Blue Lake," *Griffiths & Hunter 429*, August, 1902 (N. Y.).

Carex exserta sp. nov.

Carex filifolia var. γ *erostrata* Kükenth.; Engler's Pflanzenreich 4^{20}: 86. 1909. Not *Carex erostrata* Boott.

Very densely cespitose, the culms very slender and wiry, 5–25 cm. high, obtusely triangular, smooth, equalling or exceeding leaves, brownish, the basal sheaths filamentose. Leaves with well-developed blades two to four to a fertile culm, clustered above base, acicular, channelled, little roughened towards apex, 0.25–0.5 mm. wide, 1–10 cm. long, the sheaths tight, hyaline ventrally. Spike solitary, androgynous, 7–15 mm. long, the staminate part half or more length of whole, the scales reddish-brown, obovate, obtuse, minutely hyaline margined, the pistillate part up to 6 mm. wide with two to twelve ascending perigynia, the scales orbicular-ovate, obtuse, dull reddish brown with hyaline margins, exceeded by ripe perigynia. Bract scale-like or slightly developed. Perigynia obovoid, obtusely triangular, 2–5 mm., nearly 2 mm. wide, rounded at base and apex, nerveless, but obscurely two-ridged, essentially beakless, papillose-puberulent, brownish tinged, hyaline and obliquely cut at mouth. Achenes triangular, obovoid, closely filling perigynia, sessile brownish, 2 mm. long, apiculate, jointed with the very short, black exserted style. Stigmas three. Racheola conspicuous.

This characteristic Californian species differs constantly from the more eastern and northern *Carex filifolia* Nutt. in the essentially beakless perigynia and the duller colored scales. The style although very short is exserted, black and conspicuous.

The following specimens have been examined, all from the Sierra Nevada of California, at elevations between 1,500 and 3,500 meters:

summit of Morro Pass, *Brewer 1733*, June 27, 1863 (Cal.); Soda Springs of Tuolumne, *Brewer 1697*, June 26, 1863 (Cal.); Black Mountain, Fresno County, *Hall & Chandler 616*, July, 1900 (Cal.); Ebbett's Pass, *Brewer 2029*, August 3, 1863 (Cal.); Big Trees, *Hillebrand 2318* (Cal.); Echo Lake, El Dorado County, *Brainerd*, July 11, 1897 (Cal.); Mt. Lyell, *Hall & Babcock 3581*, July, 1902 (Cal.); Kings River, *Lemmon*, July, 1902 (Cal.); Yosemite, *Abrams 4600*, July, 1911 (K. M.); Little Yosemite, *Jepson 4396*, July 11, 1911 (K. M.); Harrison Pass, *Jepson 5035*, July 16, 1912 (K. M.); Cold Creek, Yosemite, *Jepson 4493*, July 22, 1911 (K. M.).

Carex rugosperma sp. nov.

"*Carex umbellata* Schkuhr," Mackenzie, Bull. Torrey Club **40**: 551. 1913.

A careful study of Schkuhr's plate of *Carex umbellata* has thoroughly convinced me that what he had was the plant with short-beaked perigynia, named *Carex abdita* by Mr. Bicknell.* The plant with the long-beaked perigynia is in consequence without a name. A specimen collected by me at Tuckerton, New Jersey, in May, 1911, and in my herbarium, may be designated as the type of the above species.

* Bull. Torrey Club **35**: 492. 1908.

On the characters and relationships of the genus Monopteryx Spruce*

HENRY PITTIER

(WITH TWO TEXT FIGURES)

The name *Monopteryx* was applied by Spruce to a papilionaceous tree of the upper Río Negro, in the forest region along the boundary between Brazil and Venezuela. The name evidently refers to the broadly developed upper pair of calyx teeth, which completely enclose the floral bud and are conspicuous in the open flower. In the notes on Spruce's travels, edited by the late Alfred Russell Wallace, there are two references to this genus: The first, accompanied by a well-drawn sketch, gives the size of *M. angustifolia* Spruce and describes its strongly developed buttresses, for which the native name "sapopema," i. e. flat root, is proposed;† the second assigns the other species, *M. Uaucu* Spruce, to a place among the oil-yielding trees of Equatorial America.

The first diagnosis of the genus, accompanied by description of the two species, was given by Bentham in Martius' Flora Brasiliensis.‡

The main generic characters were found in the short, subbipartite calyx, with large upper lip formed by the union of the two anterior lobes, and in the almost obsolete lower lip, entire or obscurely tridentate, and exterior in the bud. Furthermore the petals were stated to be sessile and almost equal in length to the calyx, and the ten stamens to be free, with basifixed anthers. The stipitate ovary, surmounted by a short style, was described as uniovulate and the ovule as anatropous. Bentham supposed that the unknown legume was drupaceous, because the other affinities were with *Dipteryx*, notwithstanding which he placed the genus among the Sophoreae.

* Published by permission of the Secretary of Agriculture.

† Notes of a Botanist on the Amazon & Andes 1: 20–23; 335, *f. 29;* 480 (concerning "sapopemas"). London. 1908.

‡ 15[1]: 307–309. *pl. 122.* 1862.

Among the plants collected by myself in Venezuela in 1913 there are specimens of flowers and fruits of a tree which undoubtedly belongs to Spruce's genus, but the study of this material shows clearly that Bentham's characterization of *Monopteryx* was drawn from immature flowers. It is indeed a very well-known fact that in most, if not in all, papilionaceous flowers the stamens are free in the bud. Moreover, the drawings of the other floral details in the plate referred to above give an impression of imperfect condition of the several parts, such as it is found when dissecting undeveloped flowers. In my Venezuelan specimens I found free stamens, sessile petals, etc. in alabastra on the point of opening, but the mature flowers (FIG. 1) showed very different characters.

FIG. 1. MONOPTERYX JAHNII Pittier. Flower. Natural size.

In the calyx (FIG. 2, *a*) no traces of the three inferior lobules are found, a detail which, however, does not necessarily contradict the observations made upon the other two species. But the petals (FIG. 2, *b*), more than twice as long as the calyx, are perfectly developed, the wings and carinal petals having claws about 2.5 mm. long and well-developed auricles. The ten stamens (FIG. 2, *c*) are united into a tube 6 mm. long, slit only at the base, and the carinal stamen is longer than the others; the anthers (FIG. 2, *c'*, *c''*), bicuspidate at base and tip, are dorsifixed; the short-stipitate ovary (FIG. 2, *d*) is just as often two- as one-ovulate; and the style is much more developed than the drawings in Bentham's plate would lead one to expect.

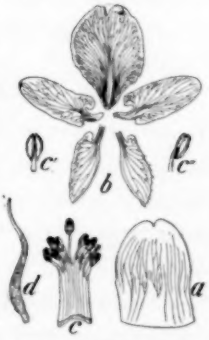

FIG. 2. MONOPTERYX JAHNII Pittier. *a*. Calyx split open. *b*. Petals. *c*. Staminal tube split open. *c'*. Stamen from the back. *c''*. Stamen from the side. *d*. Pistil. All natural size.

With reference to the fruit, there is a puzzling detail in the fact that Spruce stated that oil and a cheese-like substance were extracted from it. Considering the similarity in all structural particulars of the flowers of the Venezuelan tree and those of the two species known heretofore, they must necessarily be considered as congeneric; but on the other hand it is not readily seen how the small seeds of the former could attract the attention of the aborigines as an oil producer.

I should not be surprised, indeed, if the name *uacu* or *uaucu* had been misapplied, when used to designate a species of *Monopteryx*.

The fruits of the Venezuelan specimens are very much like those of all *Pterocarpus* species, the wing embracing the whole pod from its base to the end of the style, which, however, is on the median line and does not project outside the margin of the wing as in that genus. Besides, the seeds are apparently always single on the median line of the pod, while in *Pterocarpus* they are either single or in pairs, enclosed in a more or less orbicular pod, central to the wing.

In examining the leaves of my specimens I found on the main rachis, between the insertion of the lateral leaflets and at the base of the terminal leaflets, traces of glandular formations as mentioned by Bentham. In *M. angustifolia* the leaflets are distinctly alternate, whereas they are subopposite in my specimens; in *M. Uaucu* they are trifoliolate, and said to be opposite in the basal pair.

In the absence of the fruit and of perfectly developed stamens, the peculiar structure of the calyx as described above would justify the placing of the genus *Monopteryx* in the Geoffraeineae, with *Coumarouna* and *Pterodon*, with the difference that in the former the two broadly developed lobules are adnate. But with our present knowledge we are able to place it definitely in the Pterocarpinae and next to *Pterocarpus*.

The Venezuelan plant collected by me differs from both the species discovered by Spruce in several characters, for which reason it must be considered as new. From *Monopteryx angustifolia* it departs in having a larger number of leaflets (thirteen instead of nine), in the greater development of the inflorescence, and in the total absence of the three inferior teeth of the calyx. *Monopteryx Uaucu* is clearly differentiated by its three-foliolate leaves.

Following are the emended characteristics of the genus *Monopteryx* and a description of the new species, *M. Jahnii*.

MONOPTERYX Spruce em.

Calyx turbinatus, tubo breve subbipartito; labium superius (e laciniis 2 alte connatis) maximum, complicatum, emarginatum, florem ante anthesin includens, inferius obsoletum vel (e laciniis

3 connatis) aestivatione exterius, breve, acutum, integrum vel obscure tridentatum. Corolla papilionacea; petala unguiculata, calycis labium superius valde superantia. Vexillum obovatum vel suborbiculatum, emarginatum. Alae oblongo-cultriformes, biauriculatae, vexillo breviores. Carina subfalcata, vexillo brevior, petalis carinalibus dorso superne cohaerentibus. Stamina 10, monadelpha, inaequalia; antherae ovato-oblongae, dorso affixae, versatiles. Ovarium breve stipitatum, 1–2-ovulatum, stylo glabro, leviter arcuato, sub apice hinc stigmatoso. Legumen fusiforme, indehiscens, circumcirca late elliptico-alatum. Semen solitarium, depressum, elongato-naviculiforme, funiculo brevissimo.

Arbores Americae aequinoctialis, foliis alternis impari-pinnatis, foliolis coriaceis, petiolo inter foliola glandulifero. Racemi ad apices ramulorum paniculas laxas floribundas at parum ramosas formantes.

Genus *Pterocarpo* simile, sed differt calyce bipartito, labio superiore valde evoluto, inferiore obsoleto vel inconspicuo, et legumine fusiformi elliptico-alato nec orbiculato. Species 3, Brasiliae borealis et Venezuelae.

Monopteryx Jahnii Pittier, sp. nov.

Coma elongata, ramulis cano-pubescentibus, foliis 11–13-foliolatis, rhachide pilosulo longitudinaliter striato inter foliola glandulifero, foliolis alternis vel subopppositis, ovato- vel elliptico-acuminatis, basi rotundatis, acumine apiculatis, supra glabris subtus pallidioribus pilosulisque, petiolulis cano-pubescentibus, racemis simplicibus ad apicem ramulorum late paniculatis, rhachidibus pedicellisque leviter rufo-pubescentibus, bracteis delapsis, bracteolis ovato-acutis hirsutis caducissimis, ad basin et medium solitariis, ad calycem 2 oppositis suffultis, floribus longe pedicellatis, calyce minute rufo-pubescente, basi turbinato, labio superiore late evoluto emarginato, inferiore nullo, vexillo breve lateque unguiculato, emarginato, calyce multo longiore, glabro, ambito pallide roseo-flavido basi supra unguem macula purpurea notato, alis longe unguiculatis, cultriformibus, basi biauriculatis apice late rotundatis vexillo subaequantibus, carina subfalcata, petalis auriculatis longe unguiculatis alis angustioribus, margine superiore minute lanato-villoso, staminibus 10 monadelphis, inferiore superioribus longiore, ovario breve stipitato, 1–2-ovulato, villoso, stilo glabro apice truncato, legumine longe pedicellato, basi attenuato, late elliptico-alato, utrinque pubescente, semine depresso, anguste elongato, naviculiforme.

Arbor parva, decidua, 8–10-metralis, coma oblonga. Petiolus communis 19–25 cm. longa; foliola 6–11.5 cm. longa, 2.5–4.5 cm. lata; petioluli 4 mm. longi. Racemi usque ad 30 cm. longi, floribundi; pedicelli 8–9 mm. longi; calycis tubum circa 5 mm. longum, labio superiore 9 mm. longo; vexillum 13.5 mm. longum, 9.5 mm. latum; alae roseo-flavae, margine superiore paulo sinuata, 9 mm. longae, 3.5–3.8 mm. latae; stamina glabra 9–13 mm. longa; pistillum 17–18 mm. longum. Legumen (an maturum?) 5.5 cm. longum, 2.7 cm. latum.

VENEZUELA: Cárdenas Farm, Siquire Valley, State of Miranda, at an altitude of about 500 m., flowers and fruits, March 24, 1913 (*H. Pittier 6005*, type; U. S. Nat. Herb. Nos. 601729, 30).

I have named this species for my friend Dr. Alfred Jahn, a distinguished explorer, engineer, and botanist of Venezuela. Its local vernacular name is *tasajo*, a word used also to designate salt beef dried in the sun.

BUREAU OF PLANT INDUSTRY,
U. S. DEPARTMENT OF AGRICULTURE

Phytogeographical notes on the Rocky Mountain region V. Grasslands of the Subalpine and Montane Zones

P. A. Rydberg

In a previous paper, I have discussed the forest trees of the mountains proper. Next to the trees the most important vegetation consists of the grasses. In fact, it may be said that in most cases where the land is not covered by the forest, the grasses are the predominant plants. The principal exceptions are the following: (1) Lakes and ponds, as the aquatic grasses are few and there are no aquatic trees. (2) Rock-slides and bare cliffs, where the soil is too scant. As soon as humus and sediments have had time to increase the soil, regions of this type will gradually change into either a forest-formation or a grassland. (3) Shrub formations. These are not very common in the mountains, but more so in the foothills. They are mostly found on the borders between the forest and the grassland, and in time will change into either, usually into the former. (4) Certain brook banks, especially in the subalpine region, where the vegetation consists of species of *Mertensia*, *Senecio*, *Delphinium* and other dicotyledonous plants.

Usually the forest occupies the slopes, while the grasslands occupy either the elevated ridges or so-called "hog-backs," or else the valleys or so-called "parks." The cause of this division is pointed out, or at least suggested, in one of my preceding papers on the alpine region.* The "hog-backs" are exposed to the desiccating winds and are therefore too dry for forest growths. In the valleys too much snow lodges during the winter and melts too slowly during the summer and the trees would be suffocated. There may also be other causes. In the valleys and parks, the drainage is often too poor and the soil has become too alkaline or saline for tree growth.

The grasslands are, however, not wholly confined to the ridges and valleys. In many places, the slopes where the soil and

* Bull. Torrey Club 40: 681, 682. 1913.

drainage are both good and where there is no special exposure either to wind or snow are occupied by grasses and not by forest. In such cases it is harder to point out the causes of the conditions. In some cases the forests have been destroyed by fires, and the grasses have gained possession of the ground before a reforestation had taken place.

A. SUBALPINE ZONE

The grasslands of the Subalpine Zone resemble much those of the Alpine Zone, which has been treated in a previous article. They are, however, of comparatively less extent, only covering larger areas in the more open valleys, where too much snow lodged, and along the wind-swept "hog-backs." The former are practically a continuation of the alpine meadows, the latter of the mountain crests. The grasses are mostly the same with some additions from the Montane Zone below. The grasses confined to the Subalpine Zone only are indeed very few.

Species in the following lists marked with an asterisk (*) are restricted to the lower parts of the zone; those marked with a dagger (†) to the upper part.

1. LAKES, PONDS, BROOKS and SWAMPS

Lakes or ponds are very rare in the Subalpine Zone; they are mostly situated in amphitheaters immediately under the snow fields and are usually filled with ice until late in the spring. They are almost void of higher vegetation, which is limited to a few species of *Sparganium* and *Potamogeton*. There are, as a rule, no grasses. The only aquatic grass in the upper part of the Zone is *Catabrosa aquatica*, which is usually confined to the mountain brooks in places where the current is less swift. In the lower part of the Zone is added to this *Panicularia pauciflora*, growing in willow bogs. Th ecommon water grasses of the lower mountain regions and the Great Plains are wanting: viz. *Phragmites*, *Spartina*, *Calamagrostis*, *Panicularia americana*, and *Phalaris*.

2. MEADOWS

The wet meadows are confined to the lower and moister parts of the open valleys. In the upper part of the Zone they are practically identical with the Alpine meadow-lands; in the lower

part a number of species from the Montane Zone are added. Along the water courses perhaps the most common grass in the upper part is *Deschampsia caespitosa*. Where the soil is richer the predominant grasses are *Phleum alpinum*, *Agrostis variabilis*, *Trisetum subspicatum*, *T. majus* and several species of *Poa*. In the lower part these, except the poas, are more or less replaced by *Alopecurus aristulatus*, *Muhlenbergia comata*, *Agrostis asperifolia*, *Graphephorum muticum*, and *Danthonia californica*. Among bushes, especially along the streams, the most common grasses are *Calamagrostis canadensis*, *C. Langsdorfii*, *Panicularia nervata*, and *P. pauciflora*. In the Northern Rockies many wet meadows are made up wholly of *Alopecurus occidentalis*, but this species is rare in the Southern Rockies.

The following grasses are found in the Subalpine Zone throughout the whole Rocky Mountain region:

**Muhlenbergia racemosa*
* " *comata*
**Phleum pratense*
" *alpinum*
**Alopecurus aristulatus*
" *occidentalis*
**Agrostis asperifolia*
" *hyemalis*
" *variabilis*
Calamagrostis Langsdorfii
" *canadensis*
**Deschampsia atropurpurea*
† " *curtifolia*
" *caespitosa*
Trisetum subspicatum
" *majus*
**Graphephorum muticum*
**Danthonia californica*
* " *intermedia*
Poa pratensis
" *reflexa*
" *leptocoma*
" *alpina*
* " *Olneyi*
* " *Vaseyana*
**Panicularia nervata*
" *pauciflora*
**Hordeum jubatum*

The following are restricted to one of the two divisions:

Southern Rockies

Muhlenbergia Wolfii
**Agrostis canina*
†Deschampsia alpicola
Graphephorum Wolfii
Poa callichroa
† " *pudica*
" *occidentalis*
* " *tricholepis*

Northern Rockies

Agrostis variabilis
Poa nervosa

The following mesophytic grasses, which could be counted among the meadow-grasses, prefer, however, river banks more or less covered by shrubbery.

Calamagrostis Langsdorfii
" *canadensis*
Trisetum montanum
**Elymus glaucus*

3. DRY VALLEYS AND BENCH-LANDS

Sometimes the sides of the valleys slope gently and the meadow passes gradually into the dryer part of the valley and this into the mountain side, sometimes the sides rise in a series of steps or shelves, one above the other. These steps are the remains of former river-banks or lake-shores. They are known as benches. The grasses of the bench-lands and other drier portions of the valleys are decidedly xerophytic. They consist mostly of genera which are characteristic of the Great Plains or the Foot-hills. In the Subalpine Zone the bench-lands are not often found and are always of insignificant area. The following grasses are characteristic of the bench-lands of the Subalpine Zone:

Stipa Tweedyi
" *minor*
Poa crocata
" *longiligula*
" *lucida*
" *Buckleyana*
Bromus Porteri
" *Richardsonii*
" *polyanthos*
Agropyron violaceum
Elymus simplex

4. MOUNTAIN SLOPES

Sometimes the meadow passes gradually into the mountain slopes, without any intervening xerophytic region. The mountain grass-slope is often mesophytic in its nature, especially in the Subalpine Zone, and is much like that of the Alpine Zone. In the Northern Rockies the most important grass of such mountain sides is *Festuca ingrata*, which, however, has its best development in the Montane Zone. This grass is also common in the northern part of the Southern Rockies, but on the southern slopes of the latter its place is taken by *Festuca arizonica* and *F. Thurberi*. The latter for instance covers all the southern slopes of the Abajo Mountains in southeastern Utah, almost to the top (3,300 m. alt.). These slopes, however, are more xerophytic than the mountain

sides of the Northern Rockies. The grass flora of the mountain sides is of the following composition:

Stipa minor
* " *Nelsonii*
Agrostis hiemalis
Trisetum subspicatum
" *majus*
Poa longiligula
" *paddensis*
" *epilis*
" *confusa*
" *laevigata*
Festuca ingrata
† " *saximontana*
Bromus Richardsonii
" *Pumpellianus*
Agropyron andinum
" *Scribneri*
" *violaceum*

The following are restricted to one region:

Southern Rockies

Muhlenbergia gracilis
" *subalpina*
Poa aperta
" *longipedunculata*
Poa Fendleriana
" *Sheldonii*
Bromus Porteri

Northern Rockies

**Poa Cusickii*
" *nevadensis*
†*Agropyron latiglume*

Southern slope of the Southern Rockies

On the more xerophytic southern slopes of the Rockies of Colorado and New Mexico, the following species are the characteristic ones:

Trichachne saccharatum
Poa crocata
" *Fendleriana*
Festuca arizonica
" *Thurberi*
† " *saximontana*

5. HOG-BACKS

As stated before, the grass flora of the hog-backs or exposed ridges is practically the same as that of the rock-crests of the alpine region, except that a few of the more mesophytic grasses, as for instance *Trisetum subspicatum* and *Deschampsia curtifolia*, are lacking. A few species from the Montane Zone are added.

The following species growing in both the Northern and Southern Rockies belong here:

Calamagrostis purpurascens
†*Poa rupicola*
" *crocata*
† " *Pattersonii*
" *epilis*
" *paddensis*
" *longiligula*
Festuca curtifolia
" *saximontana*
†*Agropyron Scribneri*
† " *andinum*

The following belong here also, but are restricted to but one region:

Southern Rockies	Northern Rockies
Muhlenbergia subalpina	*Poa confusa*
" *filiculmis*	" *Cusickii*
Festuca minutiflora	*Sitanion rigidum*

B. MONTANE ZONE

The grasslands of the Montane Zone resemble more those of the Great Plains and the Foothills. In the large open valleys or so-called parks, many of the grasses are the same as those found in the valleys of the plain region, in fact many have followed the streams up from the prairies. The grass flora of the bottoms of the canyons and of the river banks is also much the same as further down in the plain region. The flora of the elevated ridges and "hog-backs" also is more or less a continuation of that of the plains, with the addition of some endemic grasses. The grass flora of the mountain slopes consists more exclusively of grasses peculiar to the mountain regions.

Species in the following lists marked with an asterisk (*) are common to the Great Plains; those marked with a dagger (†), to the Subalpine Zone. Species marked with a double dagger (‡) are northern species found at low altitudes throughout the boreal regions but not on the Great Plains or the Prairies; in the Rocky Mountains they are restricted to the Montane and Subalpine Zones. Species marked with a section (§) occur also on the Staked Plains and in the Upper Sonoran region.

1. LAKES, PONDS AND SWAMPS

The water grasses are not many. *Catabrosa aquatica* is mostly confined to slow running brooks, *Phragmites Phragmites*, *Panicularia americana* and *P. borealis* are found in lakes and ponds mostly near the shore; so also are *Phalaris arundinacea*, *Agrostis asperifolia*, *Beckmannia erucaeformis*, and *Calamagrostis Langsdorfii*, but these prefer the bogs rather than the deeper water. The following belong to this formation:

Phalaris arundinacea	**Phragmites Phragmites*		
**Calamagrostis hyperborea*	**Panicularia americana*		
Agrostis asperifolia	‡	"	*nervata*
**Beckmannia erucaeformis*	†	"	*pauciflora*
‡†*Catabrosa aquatica*	‡	"	*borealis*

The following is restricted to the Northern Rockies:
Panicularia elata

2. MEADOWS

As in the Subalpine Zone the wet meadows are situated in the more open valleys, but they are here of greater extent, as the grade of the water courses is not so steep as in the higher regions. Many of the grasses are the same as those of the subalpine meadows and even some of the alpine species, such as *Poa alpina* and *Phleum alpinum*, are occasionally found along the water courses, where the ground is kept cool by the ice water from the mountains. Still more species are common to this and the valleys of the Foothills and the Great Plains. The genera of Aveneae, such as *Deschampsia*, *Trisetum* and *Graphephorum*, become more sparing, and those of Agrostideae, such as *Agrostis*, *Muhlenbergia* and *Calamagrostis*, more common. The tribe Hordeae, rarely represented in the subalpine meadow, becomes also more frequent, especially the genus *Hordeum* and the stoloniferous species of *Agropyron*. It is scarcely worth while to indicate the principal species, for in one meadow there might be one species predominant, in another there might be another species. In the Northern Rockies the predominant species in many places are *Alopecurus occidentalis*, *Agrostis alba*, *Phalaris arundinacea*, or *Festuca vallicola*, but in the Southern Rockies this is rarely if ever the case. Here the species of *Poa* are usually predominant. The following grasses inhabit the montane meadows:

**Phalaris arundinacea*
Muhlenbergia racemosa
" *Richardsonis*
* " *comata*
" *filiformis*
Phleum pratense
† " *alpinum*
**Alopecurus aristulatus*
" *occidentalis*
Agrostis alba
" *asperifolia*
" *tenuiculmis*
* " *hiemalis*
†Calamagrostis Langsdorfii
" *canadensis*
" *Scribneri*
* " *neglecta*
* " *hyperborea*
" *micrantha*
†Deschampsia caespitosa
†Trisetum majus
Graphephorum muticum
Danthonia californica
" *intermedia*
**Eatonia intermedia*
Melica spectabilis
" *bulbosa*
Poa pratensis
" *reflexa*
" *leptocoma*
* " *triflora*
† " *alpina*
" *Wheeleri*
" *Olneyi*
" *pratericola*
**Panicularia nervata*
" *pauciflora*
**Agropyron pseudorepens*
**Hordeum jubatum*
* " *nodosum*
" *boreale*

The following are also found in the meadows, but are restricted to one region:

Southern Rockies

**Muhlenbergia Wrightii*
Agrostis canina
**Calamagrostis inexpansa*
Graphephorum Shearii
Graphephorum Wolfii
**Poa interior*
" *tricholepis*
Agropyron Palmeri

Northern Rockies

Panicum pacificum
Muhlenbergia squarrosa
Agrostis humilis
" *aequivalvis*
" *variabilis*
Calamagrostis blanda
Calamagrostis laxiflora
**Eatonia pennsylvanica*
Poa nervosa
" *longipila*
Festuca vallicola

Certain species are limited to, or more common in, the more

alkaline meadows, which are quite wet in the spring but dry in the autumn. These are:

**Puccinellia airoides*	**Agropyron Smithii*
**Spartina gracilis*	* " *molle*
**Distichlis stricta*	* " *dasystachyum*
Elymus simplex	(Northern Rockies only)

A few species may be counted to the meadow flora, but they are found only in sandy places, on creek-banks, etc., and are limited to the Southern Rockies. These are:

Muhlenbergia simplex	*Muhlenbergia Wolfii*
" *aristata*	

The following meadow species are usually most common among shrubs:

Eatonia pennsylvanica	*Savastana odorata*
Panicularia nervata	*Oryzopsis micrantha*
" *pauciflora*	*Elymus glaucus*

So also the following, which, however, are restricted to one region:

Southern Rockies	Northern Rockies
Stipa Porteri	*Melica subulata*
Panicularia Holmii	*Panicularia elata*
Festuca fratercula	*Festuca elatior*

3. Dry Valleys and Bench-lands

The dry valleys and bench-lands are more common and of greater extent in the Montane Zone than in the Subalpine, and more common in the Northern Rockies than in the Southern. Except in the three parks of Colorado (Northern, Middle and Southern) they are also as a rule smaller in the Southern Rockies. The grasses are composed mainly of two elements, the species common to the Great Plains and those endemic to the mountains. In the drier parts of the valleys there are scarcely any high northern ones running south in the mountains. In the southern portion of the Southern Rockies, there are a few species

belonging to the Staked Plains and the Upper Sonoran flora. The species of *Andropogon*, *Sporobolus*, and *Koeleria* and the stoloniferous species of *Agropyron* are immigrants from the Great Plains, while those of *Stipa* (except *S. comata*) and most species of *Bromus* are endemic. The species of *Poa* and the bunched species of *Agropyron* are divided between the two categories. The following belong here:

**Andropogon furcatus*
* " *Hallii*
**Stipa comata*
" *Tweedyi*
" *viridula*
" *Nelsonii*
" *minor*
**Muhlenbergia Richardsonis*
**Sporobolus airoides*
* " *asperifolius*
* " *chryptandrus*
**Bouteloua oligostachya*
Poa crocata
" *longiligula*
" *laevigata*
" *confusa*
* " *pratericola*
* " *Buckleyana*
**Koeleria gracilis*
Festuca campestris
Bromus polyanthus
‡ " *Richardsonii*
" *Pumpellianus*
‡Agropyron violaceum
* " *tenerum*
‡ " *caninum*
* " *pseudorepens*
* " *Smithii*
* " *molle*
" *spicatum*
**Hordeum jubatum*
**Sitanion elymoides*
Elymus triticoides
" *condensatus*
" *simplex*

The following also belong here but are restricted:

Southern Rockies

Andropogon chrysocomus
§Blepharineuron tricholepis
Poa lucida
Bromus Porteri
§Festuca Thurberi
§Agropyron arizonicum
§ " *Bakeri*

Northern Rockies

Stipa Richardsonii
" *Williamsii*
" *Elmeri*
Muhlenbergia squarrosa
Calamagrostis montanensis
Poa nevadensis
Bromus breviaristatus
" *Flodmanii*

Agropyron spicatum
" *Richardsonii*
* " *albicans*
Agropyron Gmelini
* " *dasystachyum*
Sitanion montanum

4. MOUNTAIN SLOPES AND HILLSIDES

The mountain slopes in the Montane Zone resemble closely those of the Subalpine Zone, but are more common and of greater extent. The number of species is much larger. As stated under the Subalpine Zone, the most important species in the Northern Rockies is *Festuca ingrata*, and its place is taken on the southern slopes of the Southern Rockies by *F. arizonica* and *F. Thurberi*. The following species are represented in both the Northern and the Southern Rockies:

**Stipa viridula*
" *Nelsonii*
" *minor*
" *Vaseyi*
Oryzopsis exigua
Agrostis hiemalis
†*Trisetum subspicatum*
† " *majus*
Poa longiligula
† " *epilis*
† " *paddensis*
" *laevigata*
†*Festuca saximontana*
" *ingrata*
" *confinis*
‡*Bromus Richardsonii*
" *Pumpellianus*
†*Agropyron andinum*
‡ " *violaceum*
* " *tenerum*
**Sitanion elymoides*
**Elymus canadensis*

The following are restricted to one region:

Southern Rockies

**Trichachne saccharatum*
Stipa Scribneri
Muhlenbergia gracilis
* " *subalpina*
Melica Porteri
Poa aperta
" *macroclada*
" *Fendleriana*
Poa longipedunculata
" *Sheldonii*
§*Festuca fratercula*
§ " *arizonica*
§ " *Thurberi*
Bromus lanatipes
" *Porteri*
§*Sitanion molle*

Northern Rockies

Stipa Richardsonii
" *Lettermannii*
Poa Cusickii
" *nevadensis*
Elymus innovatus
†*Agropyron latiglume*
" *spicatum*

5. HOG-BACKS AND DRY RIDGES

The flora here consists mostly of grasses from the Great Plains intermixed with some elements from the Subalpine Zone. The grass flora is rather poor in number of species. This is especially the case if those common to the hillsides are eliminated. The flora includes the following grasses:

**Aristida longiseta*
* " *Fendleriana*
Stipa viridula
**Calamagrostis purpurascens*
Avena americana
Danthonia intermedia
Bouteloua oligostachya
**Koeleria gracilis*
Poa crocata
† " *paddensis*
†*Festuca brachyphylla*
† " *saximontana*
†*Agropyron andinum*
† " *Scribneri*
" *spicatum*

The following are restricted to one region:

Southern Rockies

Stipa Vaseyi
†*Muhlenbergia subalpina*
" *filiculmis*
Poa Fendleriana

Northern Rockies

†*Poa Cusickii*
**Festuca campestris*
†*Sitanion rigidum*
" *lanceolatum*

To the preceding formations may be added the following five in which the grasses do not constitute the principal or predominant species:

6. WOODS

The truly wood species of grasses are very few, and even these do not grow in the deep forest but in more open places. They are the following:

Oryzopsis asperifolia
Cinna latifolia
Avena striata
Poa compressa
Festuca Jonesii

To these are added in the Northern Rockies:

Calamagrostis Suksdorfii *Deschampsia elongata*

7. COPPICES AND RIVER BANKS

The following prefer more or less shaded situations among bushes, or on river banks among willows, birches, or alders:

§*Savastana odorata*
Stipa Richardsonii
Oryzopsis exigua
" *micrantha*
Calamagrostis canadensis
" *Langsdorfii*
Sporobolus cryptandrus
Panicularia nervata
" *pauciflora*
Festuca elatior
Elymus glaucus

Limited to one region:

Southern Rockies	Northern Rockies
Trisetum montanum	*Deschampsia elongata*
Panicularia Holmii	*Panicularia elata*
Melica Porteri	*Melica subulata*

8. SAND-DRAWS AND SAND-HILLS

A few species characteristic of the sand-hill regions of Nebraska and Kansas enter the river valleys, growing on sandy river-banks, draws, and in bottoms of canyons. They are:

Panicum barbipulvinatum
Eriocoma cuspidata
Muhlenbergia pungens
Festuca octoflora
Sporobolus asperifolius
" *confusus*
" *cryptandrus*

To these are added in the Southern Rockies:

Bouteloua prostrata
Muhlenbergia Thurberi
" *gracillima*
Munroa squarrosa
Elymus ambiguus

9. HOT SPRING FORMATION

In the Northern Rockies, especially in the Yellowstone National Park, there are found many hot springs. The minerals held in solution in the hot water, mostly silicates, are deposited,

forming often large fields of deposits in the form of crusts, which in course of time often become broken up and form sand fields. These hot spring formations have a peculiar flora of their own. The grasses are not many, however, but at least two of them have, so far as the writer knows, never been found elsewhere. These are *Panicum thermale* and *Deschampsia pungens*. The former has been collected also around hot springs in California. Besides these *Spartina gracilis* and *Panicum barbipulvinatum* are common. These are plants from the Great Plains, the former frequent in alkaline meadows and the latter in sand-draws. Another plant although not a grass, but a sedge, may be mentioned here, viz. *Eleocharis thermalis*, growing in the pools below the springs with water even too hot for a comfortable bath.

10. RUDERAL REGIONS

A few of the ruderal grasses of the Great Plains and the regions east thereof have been found near dwellings, along roads, in fields and in waste places as high up as within the limits of the Montane Zone. These are:

Synthyrisma humifusum
Panicum capillare
" *barbipulvinatum*
Poa annua
Dactylis glomerata
Chaetochloa glauca
Polypogon monspeliensis
Avena fatua
Bromus hordeaceus
" *secundus*

NEW YORK BOTANICAL GARDEN

INDEX TO AMERICAN BOTANICAL LITERATURE

1912–1915

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in the broadest sense.

Reviews, and papers that relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

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